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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/797,595

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Yusuke Sakagami

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27572

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EXAMINER

GARCIA JR, RENE

ART UNIT

PAPER NUMBER

2853

DATE MAILED: 02/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/797,595

Applicant(s)

SAKAGAMI ET AL.

Examiner

Rene Garcia, Jr.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 6-24 is/are rejected.
- 7) ☒ Claim(s) 4 and 5 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 July 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>10/14/04; 3/10/04</u> | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement filed 24 September 2004 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because it has not been provided to the office. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

Specification

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

3. The abstract of the disclosure is objected to because undue length. Correction is required. See MPEP § 608.01(b).

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

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The following title is suggested: Droplet Ejection Apparatus with Ejection Failure Detection Means.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 2 and 24 are rejected under 35 U.S.C. 102(b) as being anticipate by Billet (US 6,010,205).

Billet discloses the following claimed limitations:

*regarding claim 1, droplet ejection apparatus/**print device, 2/** having a driving circuit (nozzles are being fired therefore has a driving circuit; col. 3, lines 1-26, a reciprocating mechanism (col. 2, lines 50-54) and a plurality of droplet ejection heads/**print heads, 6-28/** (col. 2, lines 32-49) each including a cavity filled with a liquid, a nozzle communicated with the cavity (col.2, lines 55-67)), and an actuator (piezoelectric controlled nozzle, col. 3, line 55-60), the droplet ejection head ejecting the liquid within the cavity through the nozzle in the form of droplets by driving the actuator by means of the driving circuit to change an internal pressure of the cavity while moving the plurality of droplet ejection heads relatively with respect to a droplet receptor/**sheet, 4/** by the reciprocating mechanism so that the ejected droplets land on the droplet receptor (col. 3, line 1-26), the droplet ejection apparatus comprising:

*ejection failure detecting means for detecting an ejection failure of the droplet ejected through each of the nozzles (col. 4, lines 2-12 and line 60)

*wherein the ejection failure detecting means detects the ejection failure with respect to a droplet ejection operation of each droplet ejected through the nozzles when the plurality of droplet ejection heads eject the droplets onto the droplet receptor (fig. 1)

*regarding claim 2, counting means for counting/recording/ the number of ejection failures detected by the ejection failure detecting means (col. 4, line 2-12 & col. 6, lines 5-14)

*regarding claim 24, droplet ejection apparatus includes an ink jet printer/print device, 2/ (col. 2, lines 23-30)

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Billet (US 6,010,205) in view of Takazawa et al. (US2002/0018090).

Billet disclose all the claimed limitations except for the following:

*regarding claim 3, informing means for informing that effect in the case where the number of ejection failures with respect to the droplet receptor counted by the counting means when the droplet ejection head eject the droplets onto the droplet receptor exceeds a predetermined reference value

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Takazawa et al. disclose the following:

*regarding claim 3, informing means for informing that effect in the case where the number of ejection failures with respect to the droplet receptor counted by the counting means/**determination circuit, 741/** (paragraph 0101) when the droplet ejection head eject the droplets onto the droplet receptor exceeds a predetermined reference value (fig. 5; paragraph 0101 – if one nozzle has failed then recovery proceeds at step S512) for the purpose of determining failed nozzles and maintaining print quality

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an informing means for informing that effect in the case where the number of ejection failures with respect to the droplet receptor counted by the counting means when the droplet ejection head eject the droplets onto the droplet receptor exceeds a predetermined reference value as taught by Takazawa et al. into Billet for the purpose of determining failed nozzles and maintaining print quality.

9. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Billet (US 6,010,205) as modified by Takazawa et al. (US2002/0018090) as applied to claim 3 above, and further in view of Oyen (US 2004/0165016).

Billet as modified by Takazawa et al. disclose all the claimed limitations except for the following:

*regarding claim 6, reference value is changeable

*regarding claim 7, droplet ejection apparatus has a plurality of operation modes in which the reference values are different from each other, and the operation mode is changeable

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Oyen discloses the following:

*regarding claim 6, reference value is changeable (depending on failure strategy to be used, the number of failed nozzles is variable) for the purpose of allowing flexibility dependent on desired output

*regarding claim 7, droplet ejection apparatus has a plurality of operation modes in which the reference values are different from each other, and the operation mode is changeable (paragraph 0037, 0038 and 0044-0055: Strategies take into account the number of failed nozzles and type of image to be printed) for the purpose of determining the best failure compensation strategy.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a reference value is changeable; and droplet ejection apparatus has a plurality of operation modes in which the reference values are different from each other, and the operation mode is changeable as taught by Oyen into Billet as modified by Takazawa et al. for the purposes of allowing flexibility dependent on desired output; and determining the best failure compensation strategy.

10. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Billet (US 6,010,205) as modified by Usui et al. (US 2002/0170353) as applied to claim 8 above, and further in view of Simons et al. (US 2002/0089562).

Billet as modified by Usui et al. disclose all the claimed limitations except for the following:

*regarding claim 9, ejection failure detecting means includes judging means for judging a cause of the ejection failure in the case where it is determined that there is the ejection failure

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of the droplets in the droplet ejection heads on the basis of the vibration pattern of the residual vibration of the diaphragm

Simons et al. discloses the following:

*regarding claim 9, ejection failure detecting means includes judging means for judging a cause of the ejection failure in the case where it is determined that there is the ejection failure of the droplets in the droplet ejection heads on the basis of the vibration pattern of the residual vibration of the diaphragm (paragraph 0005) for the purpose of detecting air bubbles in the system

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an ejection failure detecting means includes judging means for judging a cause of the ejection failure in the case where it is determined that there is the ejection failure of the droplets in the droplet ejection heads on the basis of the vibration pattern of the residual vibration of the diaphragm as taught by Simons et al. into Billet as modified by Usui et al. for the purpose of detecting air bubbles in the system.

11. Claims 11-18 are rejected under 35 U.S.C. 103(a) as being obvious over Billet as modified by Usui et al. (US 2002/0170353) as applied to claims 8 and 10 above, and further in view of Shinkawa et al. (US 2004/0223027).

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of

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invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

Billet as modified by Usui et al. disclose all the claimed limitations except for the following:

*regarding claim 11, judging means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold

*regarding claim 12, ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component of the actuator that varies with the residual vibration of the diaphragm

*regarding claim 13, ejection failure detecting means includes a resistor element connected to the actuator, and the oscillation circuit forms a CR oscillation circuit based on the

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electric capacitance component of the actuator and a resistance component of the resistor element

*regarding claim 14, ejection failure detecting means includes an F/V converting circuit that generates a voltage waveform in response to the residual vibration of the diaphragm from a predetermined group of signals generated based on changes in an oscillation frequency of an output signal from the oscillation circuit

*regarding claim 15, ejection failure detecting means includes a waveform shaping circuit that shapes the voltage waveform in response to the residual vibration of the diaphragm generated by the F/V converting circuit into a predetermined waveform

*regarding claim 16, waveform shaping circuit includes: DC component eliminating means for eliminating a direct current component from the voltage waveform of the residual vibration of the diaphragm generated by the F/V converting circuit; and a comparator that compares the voltage waveform from which the direct current component thereof has been eliminated by the DC component eliminating means with a predetermined voltage value

*wherein the comparator generates and outputs a rectangular wave based on this voltage comparison

*regarding claim 17, ejection failure detecting means includes measuring means for measuring the cycle of the residual vibration of the diaphragm based on the rectangular wave generated by the waveform shaping circuit

*regarding claim 18, measuring means has a counter, and measures either a time between rising edges of the rectangular wave or a time between a rising edge and falling edge of the rectangular wave by counting pulses of a reference signal with the counter

Skinkawa et al. disclose the following:

*regarding claim 11, judging means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle (paragraph 0195 and 0198-0200); the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold (paragraph 0195, 0201 and 0202); and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold (paragraph 0195 and 0203-0205) for the purpose of determining the cause of ejection failure

*regarding claim 12, ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component of the actuator that varies with the residual vibration of the diaphragm (paragraph 0206) for the purpose of detecting ejection failure

*regarding claim 13, ejection failure detecting means includes a resistor element connected to the actuator, and the oscillation circuit forms a CR oscillation circuit based on the electric capacitance component of the actuator and a resistance component of the resistor element (paragraph 0207) for the purpose of detecting ejection failure

*regarding claim 14, ejection failure detecting means includes an F/V converting circuit that generates a voltage waveform in response to the residual vibration of the diaphragm from a predetermined group of signals generated based on changes in an oscillation frequency of an output signal from the oscillation circuit (fig. 19; paragraph 0206, 0217) for the purpose of detecting ejection failure

*regarding claim 15, ejection failure detecting means includes a waveform shaping circuit that shapes the voltage waveform in response to the residual vibration of the diaphragm generated by the F/V converting circuit into a predetermined waveform (fig. 16; paragraph 0206 and 0220) for the purpose of detecting ejection failure

*regarding claim 16, waveform shaping circuit includes: DC component eliminating means for eliminating a direct current component from the voltage waveform of the residual vibration of the diaphragm generated by the F/V converting circuit; and a comparator that compares the voltage waveform from which the direct current component thereof has been eliminated by the DC component eliminating means with a predetermined voltage value

*wherein the comparator generates and outputs a rectangular wave based on this voltage comparison (paragraph 0220 and 0221) for the purpose of detecting ejection failure

*regarding claim 17, ejection failure detecting means includes measuring means for measuring the cycle of the residual vibration of the diaphragm based on the rectangular wave generated by the waveform shaping circuit (paragraph 0236) for the purpose of detecting ejection failure

*regarding claim 18, measuring means has a counter, and measures either a time between rising edges of the rectangular wave or a time between a rising edge and falling edge of the rectangular wave by counting pulses of a reference signal with the counter (paragraph 0237) for the purpose of detecting ejection failure

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a judging means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold; ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component of the actuator that varies with the residual vibration of the diaphragm; ejection failure detecting means includes a resistor element connected to the actuator, and the oscillation circuit forms a CR oscillation circuit based on the electric capacitance component of the actuator and a resistance component of the resistor element; ejection failure detecting means includes an F/V converting circuit that generates a voltage waveform in response to the residual vibration of the diaphragm from a predetermined group of signals generated based on changes in an oscillation frequency of an output signal from the oscillation circuit; ejection failure detecting means includes a waveform shaping circuit that shapes the voltage waveform in response to the residual vibration of the diaphragm generated by the F/V

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converting circuit into a predetermined waveform; waveform shaping circuit includes: DC component eliminating means for eliminating a direct current component from the voltage waveform of the residual vibration of the diaphragm generated by the F/V converting circuit; and a comparator that compares the voltage waveform from which the direct current component thereof has been eliminated by the DC component eliminating means with a predetermined voltage value, wherein the comparator generates and outputs a rectangular wave based on this voltage comparison; ejection failure detecting means includes measuring means for measuring the cycle of the residual vibration of the diaphragm based on the rectangular wave generated by the waveform shaping circuit; and measuring means has a counter, and measures either a time between rising edges of the rectangular wave or a time between a rising edge and falling edge of the rectangular wave by counting pulses of a reference signal with the counter as taught by Shinkawa et al. into Billet as modified by Usui et al. for the purposes of determining the cause of ejection failure and detecting ejection failure.

12. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Billet (US 6,010,205) in view of Choi (US 2003/0156149).

Billet disclose all the claimed limitations except for the following:

*regarding claim 19, switching means for switching a connection of the actuator from the driving circuit to the ejection failure detecting means after carrying out the droplet ejection operation by driving the actuator

*regarding claim 20, one or more ejection failure detecting means and one or more switching means

*wherein the switching means corresponding to the droplet ejection head that has carried out the droplet ejection operation switches the connection of the actuator from the driving circuit to the corresponding ejection failure detecting means, and then the switched ejection failure detecting means detects an ejection failure of the droplets

Choi discloses the following:

*regarding claim 19, switching means/**switching unit, 42/** (fig. 3) for switching a connection of the actuator from the driving circuit to the ejection failure detecting means after carrying out the droplet ejection operation by driving the actuator (paragraph 0035) for the purpose of either creating an image by droplet ejection or detecting for failed nozzles

*regarding claim 20, one or more ejection failure detecting means/**nozzle failure detecting unit, 40/** (paragraph 0031; fig. 2) and one or more switching means/**switching unit, 42/**

*wherein the switching means corresponding to the droplet ejection head that has carried out the droplet ejection operation switches the connection of the actuator from the driving circuit to the corresponding ejection failure detecting means, and then the switched ejection failure detecting means detects an ejection failure of the droplets (paragraph 0033 and 0035) for the purpose of either creating an image by droplet ejection or detecting for failed nozzles

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a switching means for switching a connection of the actuator from the driving circuit to the ejection failure detecting means after carrying out the droplet ejection operation by driving the actuator; and one or more ejection failure detecting means and one or more switching

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means, wherein the switching means corresponding to the droplet ejection head that has carried out the droplet ejection operation switches the connection of the actuator from the driving circuit to the corresponding ejection failure detecting means, and then the switched ejection failure detecting means detects an ejection failure of the droplets as taught by Choi into Billet for the purpose either creating an image by droplet ejection or detecting for failed nozzles.

13. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Billet (US 6,010,205) in view of Sakai et al. (US 6,234,607).

Billet disclose all the claimed limitations except for the following:

- * regarding claim 21, actuator includes an electrostatic actuator

Sakai et al. disclose the following:

*regarding claim 21, actuator includes an electrostatic actuator/111/ (paragraph 0190) for the purpose of vibrating ink to the point that the ink is not discharged from the corresponding nozzle

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an actuator including an electrostatic actuator as taught by Sakai et al. into Billet for the purpose of vibrating ink to the point that the ink is not discharged from the corresponding nozzle.

14. Claims 8, 10, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Billet (US 6,010,205) in view of Usui et al. (US 2002/0170353).

Billet disclose all the claimed limitations except for the following:

*regarding claim 8, each of the droplet ejection heads includes a diaphragm that is displaced when the actuator is driven

*wherein the ejection failure detecting means detects a residual vibration of the diaphragm and determines an ejection failure based on a vibration pattern of the detected residual vibration of the diaphragm

*regarding claim 10, vibration pattern of the residual vibration of the diaphragm includes a cycle of the residual vibration

*regarding claim 22, actuator includes a piezoelectric actuator having a piezoelectric element and using a piezoelectric effect of the piezoelectric element

*regarding claim 23, storage means for storing a cause of the ejection failure of the droplets detected by the ejection failure detecting means in association with the nozzle for which the detection was carried out

Usui et al. disclose the following:

*regarding claim 8, each of the droplet ejection heads includes a diaphragm/**vibrating plate, 176/** that is displaced when the actuator/**106/** is driven (paragraph 0107, 0160 and 0161; fig. 20 and 21) for the purpose of ejecting droplets

*wherein the ejection failure detecting means detects a residual vibration of the diaphragm and determines an ejection failure based on a vibration pattern of the detected residual vibration of the diaphragm (paragraph 0169) for the purpose of detecting ejection failure

*regarding claim 10, vibration pattern of the residual vibration of the diaphragm includes a cycle of the residual vibration (paragraph 0284 – “resonant frequency”) for the purpose of failure type determination

*regarding claim 22, actuator includes a piezoelectric actuator having a piezoelectric element and using a piezoelectric effect of the piezoelectric element (paragraph 0009; paragraph 0161) for the purpose of ejection of droplets

*regarding claim 23, storage means/**memory device, 7/** for storing a cause of the ejection failure of the droplets detected by the ejection failure detecting means in association with the nozzle for which the detection was carried out (figs. 43A, 43B, 43C; paragraph 0282 and 0284) for the purpose of providing information to controller to determine type of nozzle failure

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize each of the droplet ejection heads includes a diaphragm that is displaced when the actuator is driven, wherein the ejection failure detecting means detects a residual vibration of the diaphragm and determines an ejection failure based on a vibration pattern of the detected residual vibration of the diaphragm; ejection failure detecting means includes judging means for judging a cause of the ejection failure in the case where it is determined that there is the ejection failure of the droplets in the droplet ejection heads on the basis of the vibration pattern of the residual vibration of the diaphragm; actuator includes a vibration pattern of the residual vibration of the diaphragm includes a cycle of the residual vibration; piezoelectric actuator having a piezoelectric element and using a piezoelectric effect of

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the piezoelectric element; and storage means for storing a cause of the ejection failure of the droplets detected by the ejection failure detecting means in association with the nozzle for which the detection was carried out as taught by Usui et al. into Billet for the purposes of ejecting ink, detecting ejection failure, failure type determination; ejection of droplets; and providing information to controller to determine type of nozzle failure.

Allowable Subject Matter

15. Claims 4 and 5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

16. The following is a statement of reasons for the indication of allowable subject matter: The primary reason for the allowance of claims 4 and 5 is the inclusion of the limitations being for a droplet ejection apparatus including droplet receptor transporting means which carries out discharge and feed of the droplet receptor; wherein, in the case where the number of ejection failures with respect to the droplet receptor counted by the counting means when the plurality of droplet ejection heads eject the droplets onto the droplet receptor exceeds a predetermined reference value, the droplet ejection apparatus stops the droplet ejection operation onto the droplet receptor, and operate the droplet receptor transporting means to discharge the droplet receptor from and feed another droplet receptor to the droplet ejection apparatus to carry out a new and same droplet ejection operation with respect to the fed droplet receptor. It is these limitations found in each of the claims, as they are claimed in the combination, that has not been found, taught or suggested by the prior art of record which makes these claims allowable over the prior art.

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Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tokumaru et al. (US 6,257,694) includes ejection failure means related to air bubbles and switching means to control function as a detection or ejection system. Watanabe (US 4,484,199) includes an air bubble and ejection failure counting means. Wouters et al. (US 2004/0001116) includes methods for cleaning nozzle plate with paper dust build up and air bubbles.


Communications with the USPTO

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rene Garcia, Jr. whose telephone number is (571) 272-5980. The examiner can normally be reached on M-F 8:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen D. Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Rene Garcia Jr.
06 February 2006

 2/04
K. FEGINS
PRIMARY EXAMINER